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Overweight and obesity among Indigenous children: individual and social determinants

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Executive summary

What is the problem?

Obesity rates are higher among Indigenous, compared to non-Indigenous, Australians, and this problem begins in early childhood. If this trend of increasing obesity among Indigenous children continues, there will be a corresponding negative impact on health, and the gap in life expectancy will widen, not close.

Childhood is a critical life stage, and early intervention strategies can reap a lifetime of rewards. Childhood obesity prevention programs have predominantly targeted individual behaviours (such as physical inactivity and unhealthy diet) and have been unsuccessful to date. The approach needs to shift to addressing social and economic factors, rather than individual behaviours in isolation.

Why is it relevant to policymakers?

In February 2014, Prime Minister Tony Abbott acknowledged that progress against the Closing the Gap targets was disappointing and that a change of direction was needed. This should encompass a shift in focus away from individual factors and onto social and economic factors.

As an example of relevance to state and territory policymakers, the ACT Chief Minister and Minister for Health Katy Gallagher has called for obesity prevention efforts to move beyond the health portfolio, towards a coordinated effort across all arms of government. This requires action on the food environment, schools, workplaces, urban planning and social inclusion. As part of her plan, Gallagher recently announced a ban on soft drinks in public schools in the ACT.

What does the evidence say?

To date, there has been a limited evidence base to guide the development of programs and policies for obesity prevention among Indigenous children. It has been recognised that social and economic factors are important, but empirical evidence is required to quantify the relative contribution of these factors and to work out which factors are the most important ones to target first.

Data from the Longitudinal Study of Indigenous Children (LSIC), a national study managed by the Australian Government Department of Social Services, show that individual choices are strongly influenced by the broader context. In 2011, Indigenous children experiencing disadvantage at both the individual and the neighbourhood level consumed significantly more soft drink than more advantaged Indigenous children in the survey. Maternal education, housing stability, urbanisation and neighbourhood disadvantage are important factors affecting Indigenous children's soft drink consumption, and therefore risk of obesity.

What should policymakers do?

If programs are to change the health behaviours and health outcomes of Indigenous children successfully, they must address social and economic factors—the context in which individual choices are made. Factors influencing obesity are not confined to the health portfolio; policy development should occur across portfolios including housing, education, employment, social welfare and community development.

The broader benefits of such programs should be considered when weighing the cost. Research conducted at the National Centre for Social and Economic Modelling, University of Canberra, estimated that if Australia were to adopt the recommendations of the WHO Commission on Social Determinants of Health report "Closing the gap within a generation", half a million Australians could avoid suffering a chronic disease; 170,000 more Australians could enter the workforce (generating earnings of $8 billion); and $4 billion in redundant welfare support payments would be saved. The implications for the wellbeing of Indigenous Australians, and for health equity, have not been calculated, but are undoubtedly considerable.

Introduction

What is the problem?

Aboriginal and Torres Strait Islander Australians experience a disproportionate burden of morbidity and mortality compared to non-Indigenous Australians, epitomised by the 10 year gap in average life expectancy.[1-3] Obesity is a major contributor to this gap, and it is a problem that begins in early childhood.[4] In 2012–2013, for example, nearly one-third of Aboriginal and Torres Strait Islander children between 2 and 14 years of age were estimated to be overweight or obese. By the time children were aged 15 or over, about 66 per cent were overweight or obese.[5] Rates for both age groups are much higher than those observed in the non-Indigenous population.

The excess burden of overweight and obesity in the Indigenous population is thought to reduce the average Indigenous life expectancy by between one and three years, accounting for between nine per cent and 17 per cent of the total gap in between Indigenous and non-Indigenous Australians.[4] Rising rates of childhood obesity are linked to the observed increase in type 2 diabetes among Indigenous Australian children,[6, 7] a condition that is estimated to decrease a child's life expectancy by up to 27 years.[8] If this trend of increasing obesity and chronic disease among Indigenous children continues, the gap in life expectancy is set to widen, not to close.

Being overweight or obese has physiological, social and emotional impacts throughout life, as well as significant economic consequences for individuals and the community (including the cost of lost productivity and increased health care costs).[9] The best time to try and prevent people from becoming overweight or obese is in early childhood.[10] There are two reasons why this is so. First, health risk behaviours and weight status tend to be fairly stable throughout life.[10-13] Encouraging healthy weight during childhood can set children off on a healthy trajectory and reduce their chances of developing major health problems later in life. Second, early childhood is a critical period for physiological, psychological and social development,[14-18] so stopping young children from becoming overweight or obese can improve their social and emotional wellbeing throughout life. Intervening early, therefore, is one of the best ways to progress efforts to *Close the Gap*.

The need for a new approach to tackle childhood obesity

The current approach

Overweight and obesity are caused by complex, interacting factors including genetics, metabolism, behaviours, socioeconomic status, environment and culture.[9, 19] However, most obesity prevention programs across the world ignore socioeconomic, environmental and cultural factors (referred to throughout this issue brief as social and economic factors) and instead exclusively target individual health behaviours such as physical inactivity and poor nutrition.[20]

There is no doubt that diet and other individual health behaviours influence childhood weight status. However, social and economic factors have a strong bearing on these health behaviours. In developed countries, levels of obesity and related risk behaviours (for example physical inactivity and poor diet[16]) are much higher amongst disadvantaged population groups.[21-23] There are many social and economic barriers that make it difficult for these disadvantaged groups to modify their behaviour and reduce their risk of becoming overweight or obese. They include insecure housing, poor education, low income and unemployment.[4, 24, 25]

Individuals (especially children) tend to favour food that is promoted through marketing and advertising. The most heavily marketed foods tend to be those that are the least healthy. An Australian study showed that soft drinks were the most common food product to be advertised near primary schools.[26] Additionally, children are likely to purchase food that is cheap and readily available, and often this food is unhealthy. Because of obesity's strong relationship with social and economic factors, it makes no sense to run obesity prevention programs that focus exclusively on the individual.[9, 14]

Why do we need a new approach?

Internationally, interventions to prevent child obesity have not consistently been found to be effective.[11, 27] In Indigenous communities, health experts have tried approaches that promote positive health behaviours (such as increasing fruit and vegetable intake), but they too have had limited success. Very few programs, however, have been rigorously evaluated, making it difficult to work out how to improve programs in the future.[28]

In a comprehensive 2012 review of healthy lifestyle programs for Indigenous Australians, researchers found four programs where there were some short-term health benefits:

- the Minjilang Health and Nutrition Project (Northern Territory; 1989-1990[29]),
- a community based program in four remote Western Australia Aboriginal communities (implemented in 2002[30]),
- the Gutbusters project (Torres Strait region; implemented in 1991[31]) and
- the Looma Healthy Lifestyle Project (Western Australia; initiated in 1993 and still ongoing).

One of the key findings from the review was that 'programs that operate in isolation from, or do not address, broader structural issues such as poverty and lack of access to a healthy food supply' do not work in the Indigenous context.[28 p. 1] The Looma Healthy Lifestyle Project was noted as an exemplary program, demonstrating both significant health improvements and long-term sustainability.[32] The success of this program has been attributed to its broad approach. Critical program components include the employment of a store manager committed to improving food supply and the implementation of council policies to improve food availability and physical activity.[28] To make sustained changes to the health of Indigenous people, the context (including food accessibility, availability and affordability) must be addressed.

What is a 'social determinants of health' approach?

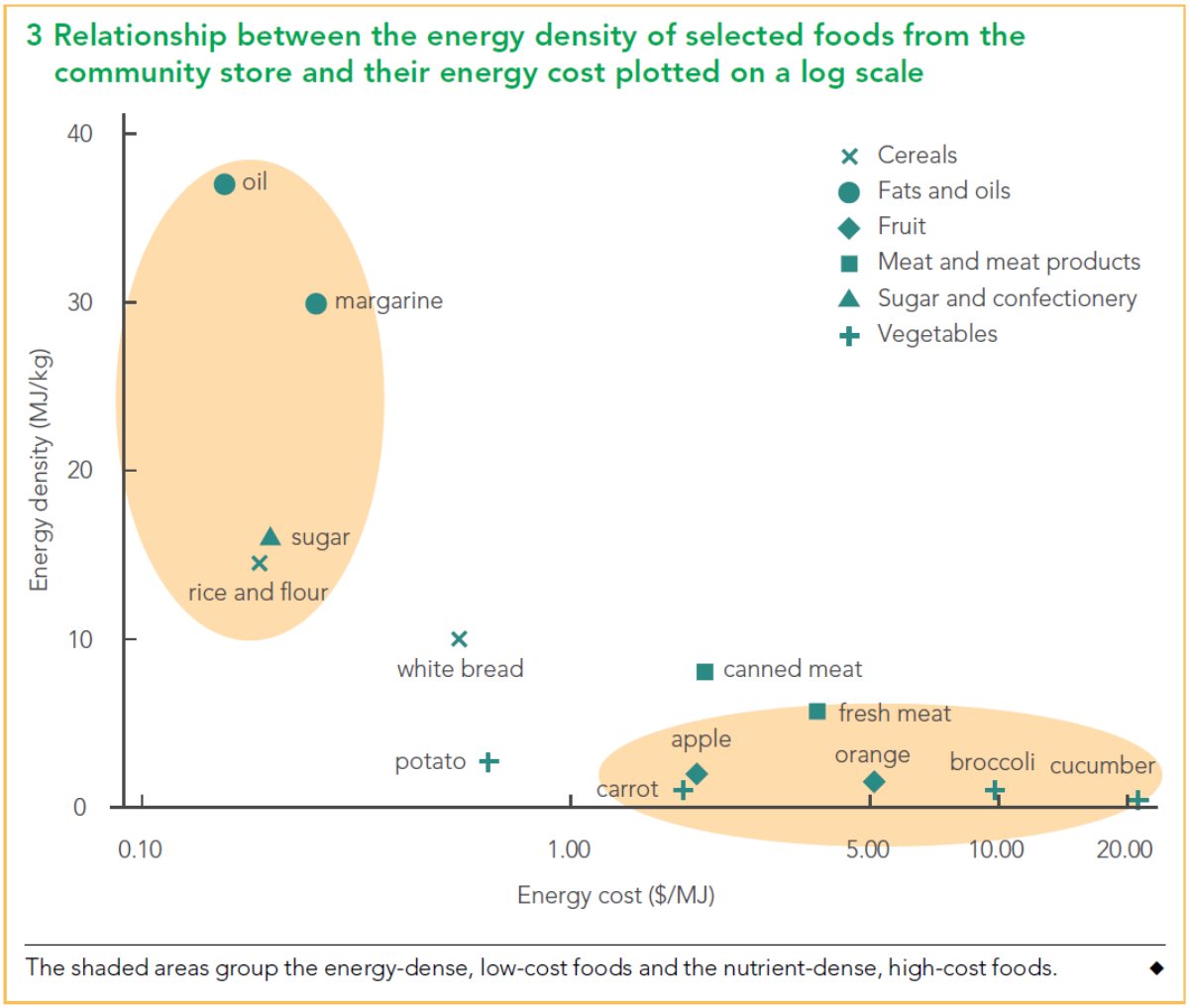
Social and economic factors influence the health of all Australians. However, their impact is more notable on Indigenous Australians because, overall, they experience greater disadvantage.[25] Indigenous socioeconomic disadvantage was estimated to be the largest contributor to the health gap from 1986-2005, accounting for one-third to one-half of the overall gap in life expectancy between Indigenous and non-Indigenous Australians.[4]

For both Indigenous and non-Indigenous Australians, there is a strong link between being overweight or obese, having an unhealthy diet (low intake of fruits and vegetables and high intake of sugar-sweetened beverages and processed foods) and developing chronic diseases.[5, 33] Improving the diet of Indigenous Australians, therefore, is one important way to improve their health status. According to the Strategic Inter-Governmental Nutrition Alliance and the National Vegetables and Fruit Coalition, if everyone in Australia increased their daily fruit intake by just 80 grams—the equivalent of an apple per day—spending on cardiovascular disease would be reduced by nearly $160 million every year.[34] The benefits for the Indigenous population would be enormous, given the low rates of fruit intake and the elevated rates of cardiovascular disease.[35]

Unfortunately, redressing the high rates of overweight and obesity among Indigenous Australians will take more than just preaching, 'another apple a day'. Dietary intake is influenced by factors including education, housing, income and the local food supply. For example, these factors influence a person's capacity to understand and apply knowledge about nutrition,[40, 41] to store and cook food,[36] and to afford healthy food options. These factors determine food security: the ability to regularly and reliably acquire appropriate and nutritious foods.[37]

Paradoxically, food insecurity increases the risk of becoming overweight and obese.[37] This is largely because healthy food tends to be more expensive than unhealthy food. If food is hard to come by, there is a higher risk of consuming energy-dense, nutrient-poor foods—such as sugar-sweetened beverages and processed foods—instead of fruits and vegetables (see Figure 1 on the following page).[22, 33, 37-39]

Figure 1: The relative cost of healthy foods versus unhealthy foods in a remote Aboriginal community store



Source: Brimblecombe JK, O'Dea K. *Med J Aust* 2009; **190**(10): 549-51

Figure 1 shows the relationship between the energy cost and energy density of foods sold in a remote Aboriginal community store.[39] Energy cost is a measure of the food's price (in dollars) for the amount of energy (in mega joules) it provides. Energy density is a measure of the energy (in mega joules) contained in the food for its weight (in kilograms). Foods that are low in 'energy cost' provide the most energy per dollar spent, and foods that are high in 'energy density' provide the most energy per amount of food.

The cheapest way to fill up your child is therefore to purchase foods low in energy cost and high in energy density. Foods that are high in energy density tend to be high in sugars and fats, and therefore unhealthy. By contrast, foods that are low in energy density tend to be high in nutrients and in water content, and therefore healthy. Unfortunately, these healthy foods (low in energy density) tend to have a high energy cost, while the unhealthy foods (high in energy density) tend to have a low energy cost. This relationship between energy cost and energy density contributes to the link between low socioeconomic status and unhealthy diet.

The cost of a healthy diet is higher than the cost of an unhealthy diet in all areas, but the discrepancy in cost is greatest within the most disadvantaged areas.[40] This means that while a healthy diet is often unaffordable for low income individuals, the unaffordability is amplified for low income individuals living in disadvantaged areas.[40] Indigenous Australians are disproportionately affected by this 'deprivation amplification'.[41] Although there is wide variation between communities, Indigenous Australians on average have lower socioeconomic status and live in more disadvantaged areas than non-Indigenous Australians. This contributes to a higher rate of food insecurity for this group.

To illustrate, nearly a quarter of Indigenous Australians aged 15 years or over reported running out of food in 2004–2005,[42] compared to only five per cent of non-Indigenous Australians. Food insecurity among Indigenous people was much more common in remote areas (36%), but remained strikingly high in urban areas (20%).[42] When individuals are disadvantaged because they have low socioeconomic status (individual-level disadvantage) and they live in disadvantaged areas (neighbourhood-level disadvantage), they often cannot purchase healthy foods, and this means that they are likely to have unhealthy dietary behaviours.[43]

For Indigenous Australians, it is particularly important to consider the effect of remoteness on health behaviours. In many remote areas, the community store is the only local food outlet. These stores often rely on an imported food supply which is vulnerable to disruption because of weather and transport-related problems. Many stores also have limited storage capacity, so they prefer to stock non-perishable foods.[44] As a result, food prices tend to be high and choices limited. Within the Northern Territory, for example, the cost of a standard food basket is 45 per cent higher in remote communities than it is in the capital, Darwin.[33] Fresh healthy foods, if available, may be prohibitively expensive, which encourages people to consume cheap processed foods.[33, 45]

In urban settings, the conventional risk factors such as low income and poor access to healthy foods also make it difficult for people to purchase and eat healthy food options. In addition, these factors interplay with issues relating to transport, busy lifestyles, abundance of fast food restaurants, budgeting and culture (such as racism and relationship to mainstream society).[37, 46]

Having ready access to affordable, healthy food options is just one way in which social and economic factors impact on weight status, and health more broadly.[38] The impact of these factors is particularly prominent in early childhood, shaping a child's foundation and long-term trajectory, providing further incentive to develop interventions for early childhood.[17, 37, 47]

What is the policy context?

Childhood obesity is an important policy issue for Australia. This is demonstrated at the state and territory level by the ACT Government's investment of $2.2 million in Healthy

Canberra Grants to fund programs targeting childhood obesity,[48] recently accompanied by a ban on soft drinks within ACT public schools.[49] These actions have arisen from the ACT Government's *Towards Zero Growth: Healthy Weight Action Plan*, which aims to keep the rates of overweight and obesity at or below current levels. This plan does not explicitly state a focus on Indigenous children, but it acknowledges the importance of targeting low income areas and those from culturally diverse backgrounds. This plan calls for action across portfolios to improve physical activity and diet; focus areas include the food environment, schools, workplaces, urban planning, social inclusion and evaluation.[50]

Taking a broader approach to combating obesity is consistent with international, national and Indigenous-specific directives. Internationally there has been growing attention on the social and economic determinants of health, brought into sharp focus by the burgeoning obesity epidemic.[51] The World Health Organisation (WHO) established a Commission on Social Determinants of Health in 2005,[52] which released a set of recommendations in their final report, encouraging countries to take on a social policy approach to achieve health equity. The overarching recommendations included improving daily living conditions (with a strong emphasis on early childhood development); tackling the inequitable distribution of power, money and resources; and measuring and understanding the problem of healthy inequity.[18]

Research conducted at the National Centre for Social and Economic Modelling, University of Canberra, estimated that if Australia were to adopt the recommendations of the WHO Report:

- half a million Australians could avoid suffering a chronic disease;
- 170,000 more Australians could enter the workforce (generating earnings of $8 billion); and
- $4 billion in redundant welfare support payments would be saved.[53]

In addition to this, every year, 60,000 hospital admissions would be averted (saving hospitals $2.3 billion), 5.5 million Medicare services would be no longer required (saving $273 million) and 5.3 million Pharmaceutical Benefit Scheme scripts would not be filled (saving $184.5 million). The implications for the wellbeing of Indigenous Australians, and for health equity, have not been calculated, but are undoubtedly striking.

Despite the enormous potential for benefit, a Senate Community Affairs Committee inquiry in March 2013 found that the Australian Government had not made any formal action in response to the 2008 WHO Commission report.[54] The Department of Health, for example, mentioned the social determinants of health only once in its 2010–2011 and 2011–2012 Annual Reports.[54] While the Australian Government has made significant financial investments in Indigenous health,[55, 56] some critics argue that insufficient funding has been allocated specifically to address the social determinants of health.[14, 57]

The Australian Government's recently published 2013–2023 *National Aboriginal and Torres Strait Islander Health Plan* provides a strong impetus to act upon the WHO's recommendation to take seriously the social determinants of health. The plan, developed in partnership with Aboriginal and Torres Strait Islander people, advocates using a systems-level, environmental approach to tackle health disadvantage, and suggests focusing on child development as an important way of making advances.[58] Considering the context, rather than individual behaviours in isolation, is particularly important for Indigenous health research. This approach falls in line with Indigenous holistic views of health, which incorporate the social, emotional and cultural wellbeing of the whole community.[58] The plan states that the Australian Government will develop implementation plans, which:

> *… acknowledge that investments outside of the health system, such as in education, housing and employment, offer great returns on health outcomes. This requires a two-tiered approach of good policy and programs in health services and policy, and interventions in other sectors related to the social determinants of health.*[58(p13)]

This sentiment was echoed in Prime Minister Tony Abbott's *Closing the Gap* report to Parliament on 12 February 2014[59] Abbott stated that progress against the *Closing the Gap* targets was disappointing, and that a change of direction was needed. He said, 'For the gap to close we must get kids to school, adults to work and the ordinary law of the land observed. Everything flows from meeting these three objectives'.[59 p. 1] Achieving these objectives requires addressing some of the social determinants of health. Recent government actions have suggested a shift towards this broad approach: the implementation of the Remote School Attendance Strategy in 40 communities ($28.4 million), a review of employment and training programs, the accelerated implementation of a Vocational Training and Employment Centres training model (up to $45 million) and the design of the Empowered Communities initiative ($5 million).[59] These actions are promising and may also contribute to sustainable improvement in the weight status of Indigenous children.

Implications

What actions are needed?

If the epidemic of overweight and obesity among Indigenous children is to be curbed, policymakers need to begin addressing the social and economic context in which people live because:

- programs and policies targeting only individual behaviours have not been effective or sustainable;[11, 14, 60]
- there is clear evidence that the environment shapes health risk behaviours;[60, 61] and,
- there is an international and national impetus to act on this evidence and adopt an environmental approach.[27, 47, 52, 54, 58]

Why isn't action being taken?

Australia's inaction on the social determinants of health has often been attributed to the lack of appropriate data and lack of capability to do the necessary data analysis.[14, 43, 54, 62] Without adequate data, it is difficult to quantify the relative contribution of individual and social and economic factors, and to work out which are the most important ones to target. Data analysis is indeed complicated, given the tangled causal pathways and complex associations between various factors.[14, 54] The lack of empirical evidence has been a major stumbling block for developing policies that might address the social and economic factors contributing to the high rates of overweight and obesity in Indigenous children.

Although better data are needed to inform policymaking in this area, the Longitudinal Study of Indigenous Children (LSIC), managed by the Australian Government Department of Social Services, is one source of relevant data that, to date, has not been fully explored.[63] Because the dataset can be used to quantify the relationship between social and economic factors and health outcomes, it is useful for making decisions on how best to tackle obesity in Indigenous children.

As an example of the power of this dataset, this issue brief presents a simple analysis investigating social and economic factors associated with one health risk behaviour in Indigenous children across Australia. This represents just one of many associations that can be explored using these data. Future research will examine additional social and economic factors and health behaviours, and their direct impact on health outcomes. The analysis outlined in this issue brief shows that data are available to garner evidence about social and economic risk factors for overweight and obesity in Indigenous children, and that the data analysis is robust enough to inform the evidence base for policy development in this area.

Methods

Longitudinal Study of Indigenous Children

The Longitudinal Study of Indigenous Children (LSIC), developed in partnership with Indigenous leaders and communities, is the first national longitudinal study on Indigenous Australian children. Participating children were sampled from 11 diverse sites across Australia, from Galiwin'ku in the Northern Territory to Western Sydney,[64] using information provided by Centrelink and Medicare Australia.[65] The study includes up to 1,759 Aboriginal and Torres Strait Islander children, representing five to 10 per cent of the Indigenous population of that age. At the time of the fourth survey, in 2011, children were between three and nine years of age.

Data collection for this publicly available dataset will remain ongoing as long as the funding and sample retention allow.[63] LSIC survey topics include the physical, social and emotional wellbeing of children and their carers, personal characteristics, education, culture, household environment and the neighbourhood environment.

Case study

There are thousands of social and economic factors that could influence health behaviours,[51] and there are hundreds of these variables collected in LSIC. This case study examines just one variable—the consumption of sugar-sweetened beverages, including soft drinks, cordial and sports drinks. This category of beverages will be described as 'soft drinks' for the remainder of this issue brief. This study looks at the association between soft drink consumption and a broad range of social and economic factors in Indigenous children. We hypothesise that these social and economic factors will influence children's dietary behaviour, demonstrating the importance of the context in shaping individual behaviour.

Soft drink consumption was chosen as the dietary behaviour of interest for several reasons:

- There is a demonstrated link between soft drink consumption and weight status in children,[66] as well as other health outcomes such as dental caries;[67-69]
- Extremely high rates of soft drink consumption have been recorded within Indigenous communities;[33, 70-72]
- There is a sparse amount of research examining factors associated with soft drink consumption,[43, 73] and a complete absence of research within the Indigenous population.[74]

Why do children consume soft drinks?

It has been suggested that consuming a serving of soft drink daily increases the risk of obesity by 60 per cent.[66] Australia is among the top ten countries worldwide for soft drink consumption, and Indigenous children have been found to consume significantly higher quantities of soft drink than non-Indigenous children.[66] There is no evidence to date on how social and economic factors contribute to soft drink consumption among Indigenous Australian children, making it difficult to develop evidence-based policy.[43, 66, 73]

The limited information available on the association between social and economic factors and soft drink consumption in non-Indigenous populations may not be appropriate for the Indigenous context.[74-76] For programs and policies to effectively decrease the consumption of soft drink by Indigenous children, research into a broad range of social and economic factors, specifically those that are meaningful to Indigenous people,[75] is required.

Data analysis

As a first step, preliminary descriptive analyses were conducted to examine the association between soft drink consumption and a range of social and economic variables. These were selected through a literature review and consideration of the measures available in the LSIC dataset. As conventional measures of socioeconomic status may not accurately reflect social positioning within Indigenous communities, multiple measures of socioeconomic status were included.[75]

In the 2011 LSIC survey, data were collected on 1,282 children. Twenty-eight per cent of LSIC children lived in urban areas, 48 per cent in low isolation areas, 15 per cent in moderately isolated areas and 10 per cent in remote areas. Of the primary carers (usually the child's mother) interviewed, 64 per cent were unemployed and 43 per cent had not achieved educational qualifications past Year 10. Around 41 per cent of families reported a lack of housing stability in the previous year.

The majority of LSIC children (79%) were in the healthy weight range in 2011, with nine per cent overweight and seven per cent obese according to WHO standards.[77] According to the primary carer's recall, over half (51%) of LSIC children consumed soft drink the day prior to the interview. Children's dietary behaviours were linked, with those consuming soft drink significantly more likely to consume high-fat foods and less likely to consume fruit.

The descriptive analyses, adjusting for age and gender only, demonstrated the impact of culture, housing, remoteness, area-level disadvantage, parental education and parental employment on this health behaviour. The probability of soft drink consumption was significantly higher among children who identified as Aboriginal rather than Torres Strait Islander, who were not taught traditional practices, who had experienced housing instability, who lived in more urban areas, who lived in disadvantaged areas, and whose primary carers had lower levels of education and were not employed.

The combined impact of these variables was explored using multilevel logistic regression. Multilevel analysis enables investigation of variation in soft drink consumption between individuals and between neighbourhoods. To identify neighbourhood effects in this study, children are grouped together based upon the Indigenous Area (a measure of small geographic areas created by the Australian Bureau of Statistics) in which they live. A logistic model was used because the outcome variable is binary (consumed soft drink or did not consume soft drink). The model was created using a number of steps, with only significant variables maintained in each sequential model.

Results

The results of the final multilevel model show that individual behaviours are strongly influenced by the broader context. Soft drink consumption was increased for children experiencing disadvantage at both the individual and neighbourhood level. The odds of consuming soft drinks were significantly higher for children whose primary carers had lower levels of education and for children who experienced housing instability (see Table 1). The odds of consuming soft drinks were two to three times higher for children living in more urban areas compared to children living in remote areas. Additionally, neighbourhood disadvantage (as measured by the Index of Relative Indigenous Socioeconomic Outcomes) was a significant predictor of sugar-sweetened beverage consumption. For children of similar background (the same age, gender, level of maternal education, housing security and remoteness), the odds of consuming soft drinks were 150 per cent higher for children living in the most disadvantaged areas, compared to the most advantaged ones.

These findings confirm the impact of social and economic factors on children's soft drink consumption, providing quantitative evidence of the importance of context in shaping individual behaviour. Neighbourhood disadvantage, remoteness, housing stability and education of the primary carer are important factors affecting soft drink consumption, and therefore weight status, for Indigenous children. Interestingly, household income, as measured by several indicators, was not a significant predictor of soft drink consumption across all areas. This may indicate that income does not influence soft drink consumption beyond its impact on parental education and housing, or that different measures of household socioeconomic status might be more relevant in this context.

Programs targeting individual behaviours alone are unlikely to bring about sustained change to diet and weight status among Indigenous children. A broader approach that addresses social and economic factors—the context in which individual choices are made—is required.[14, 54]

Table 1: Results of the final model

	Number of children in each category	Odds ratio of consuming soft drink, compared to reference group (95% confidence interval)
Education of primary carer		
Past Year 10	670 (57%)	*1.00 (reference group)*
Year 10 or less	503 (43%)	1.64 (1.27, 2.12)*
Housing instability		
No	692 (59%)	*1.00 (reference group)*
Yes	481 (41%)	1.34 (1.04, 1.73)*
Level of Relative Isolation (index of remoteness)		
High/extreme isolation (remote and very remote)	106 (9%)	*1.00 (reference group)*
Moderate isolation	166 (15%)	1.63 (0.80, 3.33)
Low isolation	566 (48%)	3.56 (1.81, 7.03)*
No isolation (urban)	335 (29%)	3.14 (1.53, 6.49)*
Area-level disadvantage		
Most advantaged	222 (19%)	*1.00 (reference group)*
Mid-advantaged	715 (61%)	1.60 (1.03, 2.50)*
Most disadvantaged	236 (20%)	2.52 (1.36, 4.66)*

* Indicates significant difference from reference group

^ Odds represent the probability of consuming soft drink divided by the probability of not consuming soft drink. The odds ratios displayed in the table represent the odds of consuming soft drink in one group, compared to the odds for the reference group. A larger odds ratio indicates that there is a larger difference in the odds between the two groups. There is always uncertainty in the calculation of these values; there is a 95% chance that the confidence interval displayed in brackets includes the true value for the odds ratio.

Discussion

Although soft drink consumption is an individual choice, this study shows a strong social and economic pattern for this behaviour.[78] This case study demonstrates the importance of addressing broader issues such as housing and education if programs are to successfully change health behaviours and outcomes.

The analysis demonstrated differences in soft drink consumption between communities across the spectrum of remoteness. These differences are attributable to differences in culture, societal norms, food availability and accessibility, among other factors. The increased odds of consuming soft drink in urban, compared to remote, areas does not indicate that soft drink consumption is not an issue in remote areas. Soft drink consumption was still high among children in remote areas, as previously described in the literature.[33, 70-72] However, this analysis uncovers a high level of soft drink consumption among Indigenous children within more urban areas. This is consistent with the increasing prominence of urban food security as a global health concern.[40] With the continuing urbanisation of the Indigenous population, this is important to address.[79] Further, given the strength of the association observed between area-level disadvantage and soft drink consumption, policymakers should start by targeting the most disadvantaged areas.

Although the evidence base is limited, it is important that new programs build upon existing ones that have demonstrated some degree of success and acceptability within Indigenous communities. While there is very little in the way of formal evaluations for many of these programs,[80] there are some exemplars that can be used to guide policy development. Some examples are listed below, but more research is required to improve the programs implemented across the country.

Promising programs

Programs addressing multiple determinants have demonstrated the potential for success. A program implemented by the Bulgarr Ngaru Medical Aboriginal Corporation offered families subsidised fruit and vegetables, health checks and nutrition education sessions.[81] This program was successfully expanded to two other Aboriginal health services, suggesting that this is a reproducible program that can be operated through Aboriginal community-controlled health services in regional communities.

The Stores Healthy Options Project in the Northern Territory is an exemplar project that could be expanded across remote communities. The project (a stepped wedge, randomised trial) is currently being implemented in 20 communities.[35] The program addresses multiple determinants of food insecurity by instituting price discounts alongside nutrition education. The study has an in-built evaluation process, enabling the prompt assessment of program impact and cost-effectiveness. This study design will create the highest level of evidence to inform policy for Indigenous Australians in remote communities.

The Eat Well Be Active community program has demonstrated success in an urban and a rural community.[82] Although this program was not specifically focused on Indigenous children, an evaluation of Aboriginal participants found that it was considered acceptable, with positive impacts.[80] In order for mainstream programs to be successfully translated to Indigenous communities, it is necessary to develop relationships with local Aboriginal staff and community members and to gather feedback throughout all stages of project development and implementation.[80] This program, and its guiding principles, should be used as a model for expansion to urban and regional Aboriginal communities across Australia.

Although limited in empirical evidence, sports and recreation programs also offer a promising avenue for obesity prevention,[60, 83] with nearly a third of Indigenous people participating in sport.[83] Successful sporting programs encourage physical activity in a fun, culturally relevant, community-based way, and link to other services such as health checks or educational development. Sustainable programs often require investment in infrastructure for physical activity and improved community safety.[60, 83] The primary aims of these programs may vary, but all programs encourage health behaviours (physical activity and healthy diet) which promote healthy childhood weight while addressing broader factors. The Indigenous Marathon Project is a successful model, recruiting Indigenous people from across Australia to participate in a marathon training program while undertaking a Certificate IV in Health and Leisure with a focus on Indigenous Healthy Lifestyle.[84] As well as improving the nutrition awareness of the participants themselves, they are empowered to share their knowledge with their community, promoting health and exercise initiatives such as the Deadly Fun Run Series.[85]

Conclusion

Childhood overweight and obesity is a significant problem for Indigenous children, and could lead to a widening of the *Gap* if prevention efforts are not improved. Despite the identified health and economic gains which can be achieved using a social determinants of health approach, Australia has yet to embed such thinking in health policy. The analysis of LSIC presented in this issue brief provides more evidence on why it is important to address the social and economic factors underpinning individual health behaviours, and thereby influencing the risk of overweight and obesity. Because the range of social and economic factors is not confined to the health portfolio, policy development should occur across portfolios, including housing, education, employment, social welfare and community development.[14, 23, 54, 61, 75]

The impact of the recent ban of soft drinks in ACT public schools on children's soft drink consumption and weight status should be evaluated. If proven successful, this approach could be expanded to other settings across Australia, particularly in disadvantaged urban areas. However, this policy in isolation will not solve the epidemic of childhood obesity for Indigenous children. The decreased accessibility of unhealthy foods should occur in parallel with the increased accessibility of healthy behaviours and foods. This requires actions addressing poverty, education, unemployment and housing, as these factors all shape a child's ability to engage in healthy behaviours.

Although there is limited evaluation of programs that address social and economic factors, there are some examples of effective programs, and enough evidence to guide program development. Where programs are working well, the principles underpinning them should be used to design larger ones. Before expanding programs to different settings, however, it is critical to ensure that the programs are transferable.[86] New programs to tackle overweight and obesity in Indigenous children need to be founded on strong relationships with the community, and tailored to meet local needs and priorities.[80] Tailoring programs to local factors will make it much more complicated to roll out programs, however the potential benefits of successfully reducing the problem of overweight and obesity among Indigenous children are large, and should be considered when weighing the cost of these approaches.[69]

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